

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 July 2004 (22.07.2004)

PCT

(10) International Publication Number
WO 2004/061864 A3

(51) International Patent Classification⁷: H05G 1/34, A61B 6/03

(74) Common Representative: KONINKLIJKE PHILIPS ELECTRONICS N.V.; c/o LUNDIN, Thomas, M., 595 Miner Road, Cleveland, OH 44143 (US).

(21) International Application Number:
PCT/IB2004/000007

(22) International Filing Date: 5 January 2004 (05.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/438,216 6 January 2003 (06.01.2003) US

(71) Applicant (for all designated States except US): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

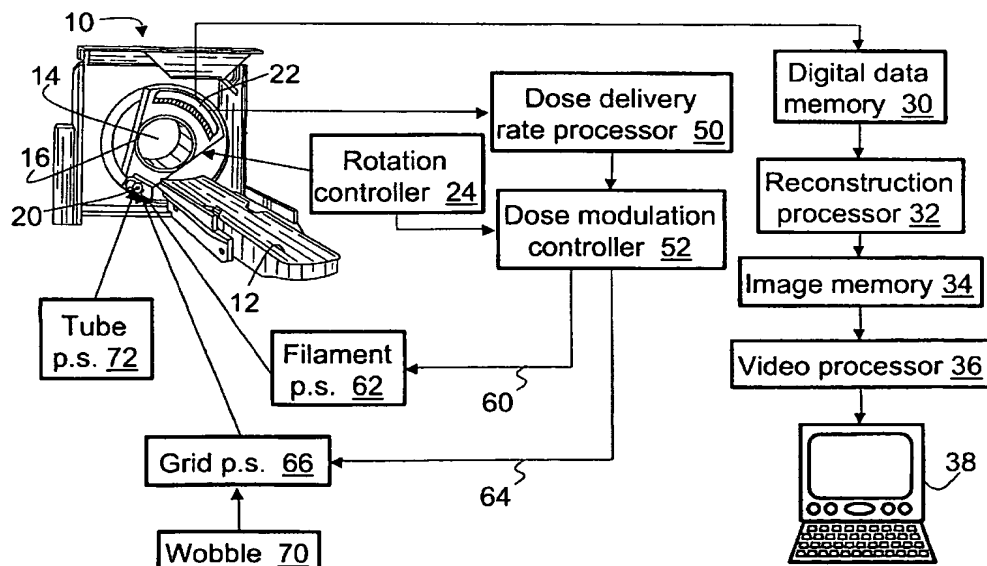
(75) Inventor/Applicant (for US only): RESNICK, Theodore, A. [US/US]; 595 Miner Road, Cleveland, OH 44143 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: HIGH SPEED MODULATION OF SWITCHED-FOCUS X-RAY TUBE



(57) Abstract: A dose-modulated irradiating system includes an x-ray tube (20) with an electro-static grid with grid electrodes (110,112) for steering the electron beam (94) on the anode (92). Grid biasing is provided for applying a time-varying electrical bias to the grid electrodes (110,112) that produces a first time-varying intensity modulation of the electron beam (94). A current of the filament (80) is modulated to produce a second time-varying intensity modulation of the electron beam (94). A controller (52) controls cooperatively combining the first and second time-varying intensity modulations to produce a combined time-varying intensity modulation.



Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

7 October 2004

INTERNATIONAL SEARCH REPORT

ational Application No
PCT/IB2004/000007

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H05G1/34 A61B6/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H05G A61B H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 822 393 A (POPESCU STEFAN) 13 October 1998 (1998-10-13)	1,12,13, 16,17, 19,22
Y	column 4, lines 26-30 column 4, line 65 - column 5, line 5	2,5,6,9, 18
X	----- US 6 385 280 B1 (BITTL HERBERT ET AL) 7 May 2002 (2002-05-07)	1,10,13
Y	column 3, lines 59-67	11
Y	----- US 5 065 420 A (LEVENE SIMHA) 12 November 1991 (1991-11-12)	2
A	column 1, lines 15-21 column 5, line 48 - line 50 ----- -/--	5,6,9

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

13 April 2004

Date of mailing of the international search report

29.07.04

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Oestreich, S

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB2004/000007

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 256 369 B1 (LAI CHING-MING)	5,6 ,9,11
A	3 July 2001 (2001-07-03) column 1, line 66 - column 2, line 2 column 2, line 49 - line 51 column 7, lines 51,52 -----	2
Y	US 4 051 377 A (KEMNER RUDOLF ET AL) 27 September 1977 (1977-09-27) abstract column 3, line 34 -----	18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2004/000007

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1, 2, 5, 6, 9-13, 16-19, 22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1,2,5,6,9-13,16-19,22

A dose modulated irradiating system with grid electrodes arranged for steering the electron beam

2. claims: 3,4,7,8,14,15,20,21

A dose modulated irradiating system with an electrostatic control electrode to reduce an intensity of the electron beam in combination with current modulating means for generating a time varying filament current.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB2004/000007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5822393	A	13-10-1998	CN 1197961 A DE 19807639 A1 JP 10295681 A	04-11-1998 15-10-1998 10-11-1998
US 6385280	B1	07-05-2002	DE 19933537 A1 JP 2000060839 A	04-05-2000 29-02-2000
US 5065420	A	12-11-1991	DE 4023490 A1	31-01-1991
US 6256369	B1	03-07-2001	CN 1268337 A DE 10010588 A1 JP 2000287960 A NL 1014799 C2 NL 1014799 A1	04-10-2000 05-10-2000 17-10-2000 03-02-2004 03-10-2000
US 4051377	A	27-09-1977	NL 7416756 A BE 836964 A1 BR 7508524 A CA 1063733 A1 DE 2555675 A1 ES 443741 A1 FR 2296185 A1 GB 1537833 A IT 1052722 B JP 1006399 C JP 51089320 A JP 54039717 B SE 7514415 A	25-06-1976 22-06-1976 24-08-1976 02-10-1979 24-06-1976 16-08-1977 23-07-1976 04-01-1979 20-07-1981 24-07-1980 05-08-1976 29-11-1979 28-06-1976

THIS PAGE BLANK (USPTO)